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EDITORIAL

Special issue on nanomaterials for energy and environmental applications

The world is facing water scarcity and energy shortage, two inextricably linked huge challenges of our times. Both water and energy supplies are reaching a critical state and ensuring sustainable water and energy supplies requires multidisciplinary scientific and technical expertise.

Widely envisioned as a key technology in the future, nanotechnology, due to its fascinating capability of tuning materials chemical and physical properties at atomic and molecular levels, provides unprecedented opportunities for solving these tremendous environmental challenges in a sustainable way. Although nanotechnology is still in an early phase of development, the past decade has seen a huge surge in socioeconomic need–driven applications of nanotechnology. This special issue of the Journal of Saudi Chemical Society is devoted to design, synthesis and applications of nanomaterials for energy and environmental applications.

I felt both privileged and honored for being approached in March 2013 by the Editor-in-Chief of Journal of Saudi Chemical Society, Professor Abdullah Al-Mayouf from King Saud University, regarding the possibility of a special issue on his journal focusing on nanotechnology. We both agreed that the special issue should have a clear focus on applications of nanotechnology and that environment and energy applications could be appealing to a broad audience of the journal given the magnitude of these grand challenges.

The call for submission to the special issue was sent out widely in April 2013. In response to the call for submission, we received over 30 submissions from all over the world, with the majority being from Middle East and North Africa (MENA) region. After a careful and rigorous peer-review process, nine submissions were finally selected, which can be broadly organized into three main categories:

(i) Nano-assisted photo-processes.
(ii) Nanomaterial based sorbents for environmental cleanup.
(iii) Green-synthesis of nanomaterials for applications.

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In the nano-assisted photo-processes category, Dr. Sirivithayapakorn discussed his recent work on modified titanium dioxide (TiO_2) for reduction of water pollutant, namely, nitrate while Dr. He presented her work on carbon-based silver bromide (AgBr) nanocomposites for converting carbon dioxide (CO_2), a notorious greenhouse gas, under visible light. Both works represent novel concepts in the field of photocatalysis. Dr. Wang then presented his findings on the decomposition of organic dyes by natural clays under natural sunlight and revealed different decomposition mechanisms involving different clays. Dr. Mohammadi-Aghdam investigated the kinetic modeling aspect of photocatalytic degradation of an organic dye in a homemade semi-batch flow photoreactor with TiO_2 nanocomposite films as immobilized photocatalyst. Cadmium zinc selenide (CdZnSe) has great potential in many energy-related applications and chemical bath deposition is a preferred method of making CdZnSe film due to its low cost. Dr. Singh examined the morphological and optical properties of the CdZnSe films and looked into the effects of the 2-mercaptoethanol capping agent and thermal treatment. It was not a big surprise that five out of nine papers for the special issues were devoted to photo-related processes as solar energy is by far the most renewable and abundant energy source available to us. It is generally believed that the solution to current environmental and energy problems should come from the wise use of solar energy.

In the category of nanomaterial based sorbents for environmental cleanup, Dr. Fakhri studied the variables that affected fluoride ion removal by maghemite nanoparticles while Dr. Rahmanifar examined permethrin pesticide removal from water by chitosan-zinc oxide nanoparticles composite. The nanomaterials in both studies are of low-cost and have high capacity for their target pollutants.

In the category of green-synthesis of nanomaterials for applications, Dr. Abdel-Wahhab presented biogenic synthesis of silver nanoparticles by Chenopodium murale leaf extract while Dr. Kumar talked about the biogenic synthesis of iron oxide nanoparticles by using an aqueous extract of Passiflora tripartita var. The biogenically synthesized nanoparticles demonstrated comparable performance than their nonbiogenic counterparts.

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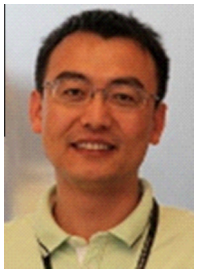
It is worth mentioning that due to the page limitation, the special issue only included a relatively small number of papers and it is by no means a complete snapshot of the field.

I would like to thank all the authors for their submissions. I am also indebted to the reviewers who have put in the hard work to review each paper in a timely and professional manner. Last, but not least, I am indebted to Professor Abdullah Al-Mayouf, for offering this opportunity of the special issue and for his valuable guidance in the entire process.

Dr. Peng Wang
Associate Professor
Environmental Science and Engineering
Biological and Environmental Science and Engineering (BESE)
Affiliated to Water Desalination and Reuse Centre
E-mail address: peng.wang@kaust.edu.sa



Professor Peng Wang is Associate professor and program chair of Environmental Science and Engineering (EnSE) at the King Abdullah University of Science and Technology (KAUST). He is the principal investigator of the Environmental Nanotechnology Laboratory at KAUST and his current research focuses on (1) development of multifunctional porous nanomaterials for highly efficient and selective removal of water decontaminants; (2) interfacial materials with controllable surface wettability for oil/water separation, water collection, oil spill cleanup, and anti-fouling surfaces; (3) anodized nanostructure array based photoelectrocatalysis and photocatalysis for water purification and water splitting. The progress of Professor Wang's research has been reflected by publications in high impact journals and coverage by regional and international media.